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BEFORE THE BOARD OF PATENT APPEALS AND INTERFERENCES

Application Number: 09/656,325
Filing Date: September 06, 2000
Appellant(s): NELSON ET AL.

Michael A. Oblon
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 05/29/2008 and 10/06/2008 (supplemental) appealing from the Office action mailed 10/30/2007.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

5,894,103	SHANN	4-1999
6,584,907	BOUCHER	7-2003

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

DETAILED ACTION

Brief Discussion of US 6584907 issued to Boucher et al. (hereinafter "Boucher")

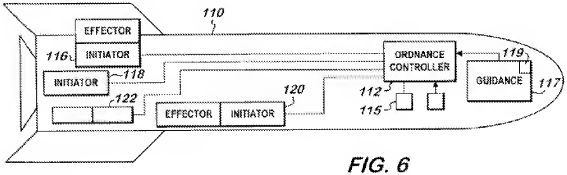

FIG. 6
(PRIOR ART)

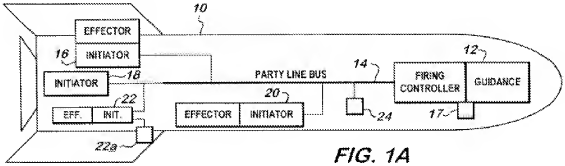

FIG. 1A

Generally, Boucher is directed to an Ordnance Firing System that utilizes a single party bus line 14 provide communication between a firing control system 12 and a plurality of

initiators 16, 18, 20, 22. A partial description of the ordnance system above can be found at column 6, lines 58-64 of the specification as follows:

> FIG. **1**A provides a schematic illustration of a missile **10** equipped with an ordnance firing system in accordance with the present invention. The ordnance firing system comprises a firing control system **12**, a communication bus **14**, and a plurality of initiators **16**, **18**, **20**, **22** for reactive effectors on the device. The initiators are connected to the bus **14** and a remote sensor **24** is also connected to bus **14**.

Boucher goes on to further describe the features of the "intelligent initiators" which include an *address code* that allows the firing control system 12 to communicate with any one or all of the initiators 16, 18, 20 and 22. The *address* code allows the firing control system to *talk* to a specific initiator in spite of the fact that only a single party bus line is used. Additionally, the initiators 16, 18, 20 and 22 may *talk* to the firing control system using the same code. The relevant portion of the specification describing these features can be found at column 9, line 36 to column 10, line 17 as follows:

Referring again to FIG. 1A, another feature of the ordnance firing system of this invention is the use of a multi-line party bus for establishing communication between the firing control system circuitry and the various initiators. This feature provides advantages irrespective of whether an initiation system employs planar, low-energy initiators and a low-energy power source. According to this feature, initiators **16**, **18**, **20** and **22** each contain communication circuitry for receiving and evaluating signals received via communication bus **14** from firing control system **12** or, optionally, at least one remote sensor **24**. Since all of the initiators are connected to the same communication bus **14**, they all receive each of the signals issued by firing control system **12**. However, in accordance with the present invention, initiators **16**, **18**, etc., contain initiator firing circuits that are programmed to recognize an address portion of signals received on communication bus **14**. The initiator firing circuit is programmed only to respond to those signals that contain an address code identified with that initiator. The address code may constitute a specific address unique to the system to that initiator, it may be a "shared" address also recognized by some other initiators in the system but not all of them, or it may be a "universal" address which all initiators connected to bus **14** recognize. Firing control system **12** and remote sensor **24** are configured to emit signals that contain the appropriate address codes so that the signals will be recognized and acted upon by the appropriate initiators. As a result of the use of coded signals, initiators **16**, **18**, etc., may be connected to shared wires in communication bus **14** and bus **14** may therefore comprise merely two or three communication wires. A four-wire bus might be used as well, to provide separate wires for arming power,

operation power, communication and ground. Similarly, initiators **16**, **18**, etc., may optionally be configured to generate and emit initiator signals onto communication bus **14**. Firing control system **12** may be designed to receive and interpret initiator signals received via bus **14**. The signal emitted by an initiator may contain an identifier code that is unique to the issuing initiator so that the firing control system can distinguish among signals from the various initiators. Accordingly, one feature of the present invention is that firing control system **12** and initiators **16**, **18**, etc., are configured for two-way communication along bus **14**. This feature of the invention allows for an ordnance firing system in which initiators can provide feedback to the control unit along the bus. The ordnance firing system can be configured so that, prior to a firing sequence, the firing control system unit issues a query signal to one or more initiators and the initiators respond to indicate their readiness to function

Boucher goes on to further describe a feature important to this appeal: the ability of the initiators to provide control over the firing process of the ordnance firing system through the use of sensors to detect external and internal conditions. A general discussion of these features begins at column 11, line 38 but the more relevant portion of the disclosure begins at column 12, line 31 which describes internal sensor 22a which is attached to the initiator as shown below.

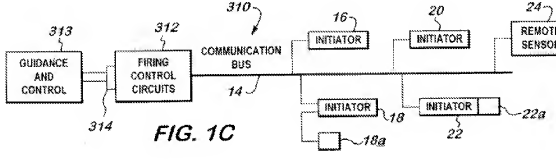

FIG. 1C

indicates favorable conditions. Similarly, initiator **22** is responsive not only to signals from firing control system **12** but also to an internal sensor **22***a* which may sense conditions inside the initiator shell. Such internal conditions may include the condition of the firing circuitry of initiator **22**, the condition of the output charge of initiator **22**, etc. Other relevant internal conditions that might be reported by sensor **22***a* include temperature, voltages, frequencies, current draw, initiation element continuity, etc. If a firing signal is received from firing control system **12** but the requisite signal is not received from the sensor **22***a*, initiator **22** may optionally be programmed to postpone firing despite the firing signal from firing control system **12**. Sensor **22***a* may thus provide a built-in test function for manufacturing quality as well as field reliability.

The internal sensor detects conditions such as *voltages*, *frequencies* and *current draw* and acts as a condition precedent to the firing of the device. As will be discussed later, this receipt of internal information and the decision process that follows can be performed prior to receipt of either the arming or firing signal.

In one embodiment of the invention, Boucher discloses "time-phased arming" in which the firing capacitor is armed through a series of arming signals sent to the initiators. However, this is only one optional means by which the firing capacitor is armed (charged).

In the embodiment of Figure 5, Boucher discloses an initiator 16c connected to party line bus 14 which is ultimately connected to a firing controller 12 as described above. The initiator includes several components but some of the more important ones are the data communication circuit 52, initiator control circuit 54, internal sensor 56, arming switch 28 and energy storage capacitor 26. Discussion of the embodiment of Figure 5 begins at column 15, line 46 as follows:

There is shown in FIG. **5** an initiator **16***c* in accordance with a specific embodiment of the present invention. Initiator **16***c* is joined to a party line bus **14**. Signals received from the firing control system via bus **14** pass through several buffer devices including common mode EMI (electromagnetic interference) filter **44**, high impedance isolators **46** and over-voltage clamp **48**. EMI filter **44** provides protection against susceptibility to random electromagnetic signals that may be inadvertently conveyed along bus **14**. Impedance isolators **46** limit the energy that can be received from bus **14** for use by the remainder of the initiator circuit.

A signal that meets the requirements of the buffer provided by EMI filter **44**, isolators **46** and clamp **48** is then conveyed to arming switch **28**, power supply circuit **50** and data communication circuit **52**. An initiator control circuit **54** receives input from data communication circuit **52** and power supply **50** as well as status information from energy storage (e.g., capacitor) **26** and the initiation element, e.g., semiconductor bridge **42***a*. When the proper input signals are received from these sources, initiator control circuit **54** may issue an arming signal. In the illustrated embodiment,

the arming signal is received by a logic gate **54***a* which also receives input from an internal sensor **56**. If the output of internal sensor **56** is appropriate for the operation of arming switch **28**, logic gate **54***a* may convey the control arming signal from control circuit **54** to arming switch **28**, through which a charging voltage may be applied to the energy storage device, i.e., a firing capacitor **26**. Optionally, charging may occur in a set fashion as described in connection with HGS. **2** and **3**. When the initiating element is a semiconductor bridge, the energy requirement for initiation is substantially smaller than in prior art devices, so firing capacitor **26**, which may typically be sized to release only 5 millijoules, may be employed for a 1-ohm SCB, obviating the need for a battery as would be required by prior art devices. When appropriate signals are received, control circuit **54** may issue a control firing signal for firing switch **58**. In the illustrated embodiment, an optional logic gate **54***b* compares the control firing signal to the output of an environmental sensor **18***a* and only conveys the control firing signal to the firing switch when the environmental sensor **18***a* indicates that conditions are appropriate for firing. The closure of firing switch **58** permits the discharge of firing capacitor **26** through the semiconductor bridge **42***a* or other initiation element, thus initiating the device.

In addition to providing input to logic gates **54***a* and **54***b*, internal sensor **56** and external sensor **18***a* may provide signals directly to initiator control circuit **54** and/or data communication circuit **52** so that initiator **16***c* can perform a self-test for readiness prior to the receipt of an arming or firing signal from party line bus **14**. Optionally, the self test can be performed in response to a query signal received from bus **14** and the results may be reported in a response signal emitted along bus **14**.

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

2. Claim 91 is rejected under 35 U.S.C. 103(a) as being unpatentable over the embodiment of Fig. 5 of US 6584907 issued to Boucher in view of the embodiment of Fig. 1A. The embodiment of Fig. 5 discloses a networked electronic ordnance system, comprising:

a. a bus controller 12

- the bus controller 12 provides digital arming and firing commands to pyrotechnic devices via network 14, each command is in *address* form and includes a code (unique identifier). Refer back to a discussion of the addressing scheme starting at pg. 9, line 46 of the specification.
- the bus controller works in conjunction with power source 17 to arm a capacitor in the pyrotechnic device.

b. a plurality of pyrotechnic devices 16, 18, 20, 22 connected to network 14 by bus controller 12, the pyrotechnic device 16c, comprising:

i. a bus interface 56:

- element 56 is disclosed as being an internal sensor.
- in a general discussion of the operation of the ordnance device, the specification disclosed internal sensors (22a) as being capable of sensing conditions such as *voltages, frequencies* and *current draw,* this qualifying element 56 as a bus interface.
- while the examiner used the applicant's admission that bus interfaces were well known in the art, it has been determined

that this admission is no longer necessary because the internal sensor performs the claimed functions.

ii. an energy storage capacitor 26;

iii. an initiator 42a;

iv. a logic device 54

- as disclosed by the specification, each initiator is "programmed" with an address code (col. 9, ll. 52-56).
- according to the embodiment of Fig. 5, if conditions are proper, logic device 54 will issue an arming (charging) signal that "stores activation energy in the capacitor" as claimed by the applicant. (Col. 15, ll. 65-67).
- the decision to fire is based on conditions precedent: 1) a properly coded firing signal from the bus controller (col. 16, ll. 15-17, "appropriate signals" refers in part to the coded firing command from the controller 12); and 2) internal and external conditions (col. 16, ll. 17-33) are received from external sensor 18a and internal sensor 56, transferred to logic gates 54a,b which then compares the conditions to the firing signal. Recall that internal sensors can measure *voltages, frequencies and current draw* (col. 12, ll. 36-39).

In the embodiment of Fig. 5, unique identifiers are not disclosed as being used. However, the embodiment of Fig. 1A discloses such a feature. Specifically, Fig. 1A

discloses initiator devices that are programmed to respond "those signals that contain an address code identified with that initiator." (Col. 9, II. 49-59). At the time of the invention, one having ordinary skill in the art would have found it obvious to provide the embodiment of Fig. 5 with the unique address features of Fig. 1A. The suggestion/motivation for doing so would have been to provide for the ability to address specific initiators and increase safety.

2. Claim 101 is rejected under 35 U.S.C. 103(a) as being unpatentable over Boucher in view of the embodiment of Fig. 1A and in further view of US 5894103 issued to Shann. Specifically, Boucher discloses the bus controller 12 for transmitting operational signals using a unique code; a plurality of pyrotechnic devices 16, 18, 20, 22 connected to network 14, the pyrotechnic device 16c comprising an initiator 42a and a logic device having a unique identifier. (Refer to the rejection of claim 91 for specifics).

In the embodiment of Fig. 5, unique identifiers are not disclosed as being used. However, the embodiment of Fig. 1A discloses such a feature. Specifically, Fig. 1A discloses initiator devices that are programmed to respond "those signals that contain an address code identified with that initiator." (Col. 9, II. 49-59). At the time of the invention, one having ordinary skill in the art would have found it obvious to provide the embodiment of Fig. 5 with the unique address features of Fig. 1A. The suggestion/motivation for doing so would have been to provide for the ability to address specific initiators and increase safety.

Boucher does not appear to disclose the disarming command that results in discharging stored activation energy. Shann discloses an abort command that can be

issued to discharge energy stored in a capacitor when it is no longer desired to fire an ordnance device (col. 4, ll. 53-59). At the time of the invention, one having ordinary skill in the art would have found it obvious to provide the combined device of Boucher with the "abort" feature of Shann. The suggestion/motivation for doing so would have been to allow a person to disarm the device and cease the firing operation in the event of an emergency.

(10) Response to Argument

A. Claim 91

3. First, the rejection has been modified to delete US 4860653 issued to Abouv as a supporting reference. While the examiner suspected the signals in the Boucher reference to be digital, it was not expressly clear in the specification that this was the case. However, further analysis of the reference (including applicant's admission in the appeal brief) that the signals are in fact digital, has warranted removal of Abouv.

4. Second, applicant's admission regarding what was known about bus interfaces has been deleted as a supporting reference. Upon further review of Boucher it has been determined that the internal components of the initiator 16c (Fig. 5) include internal components such as internal sensor 56 that "interface" with the bus to analyze voltage, frequency, current draw, etc.

5. It should be noted that the applicant's description of the Boucher reference, while correct, is not applicable. On pages 13 and 14 of the Supplemental Appeal Brief received 10/06/2008, the applicant refers to the embodiment of Figure 3 in an attempt to overcome the examiner's rejections. The embodiment of Figure 3 describes a *time-*

phased or *stepped* arming (charging) process. However, in the Final Rejection mailed 10/30/2007, the examiner specifically referred to the embodiment of Figure 5. In that embodiment, the Boucher describes an arming process in which a capacitor is charged once a single arming signal is received by a logic gate and conditions precedents are met. (Col. 15, line 65 to col. 16, line 7). The inventor goes on to say that the *time-phased* manner of arming, as described by the applicant, was an optional means of charging the capacitor. (Col. 16, ll. 7-9).

6. On page 14, last paragraph of the applicant's Brief, it is argued, "In other words, when the firing signal is received, the pyrotechnic device will attempt to initiate the initiation element, but if the capacitor has not been charged sufficiently, it will not work." Again, this argument and conclusion is based on an alternate embodiment of the Boucher invention. As discussed above, when the firing controller of the Boucher ordnance device issues a "fire" signal, the signal is compared to internal 56 and external sensors 18a by logic gates 54a and 54b. (Col. 16, ll. 15-33). Only when conditions are met will the logic gate permit the firing signal to be passed to the firing switch 58.

B. Claim 101

7. Applicant argues that while Shann teaches an abort signal, Shann does not teach an abort signal in combination with a unique identifier. As the applicant has admitted in the Brief, the examiner responded that the unique identifier is provided by Boucher. The examiner repeats that response. Referring to the rejection of claim 101, Boucher teaches every element with the exception of the limitation regarding discharging of stored activation energy upon receipt of a digital disarming command.

The only means in which the controller 12 can communicate with the pyrotechnic devices 16, 18, 20 is by means of the address code discussed at column 9, ll. 46-59. To provide a disarming feature, one of ordinary skill in the art would look to Shann and merely program Boucher with an "abort" command and provide the initiator with the necessary components so that the capacitor 26 can be properly discharged. Shann provides the teaching of how to accomplish this.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

/Troy Chambers/

Primary Examiner, Art Unit 3641

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Michael J. Carone /mjc/